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(54) **ELECTRONIC DEVICE WITH KEY MECHANISM THEREOF**

(75) Inventors: **Kun-Chih Hsieh**, Taipei Hsien (TW); **Jian-Qiang Zhao**, Shenzhen (CN); **Jin-Sheng Huang**, Shenzhen (CN)

(73) Assignees: **Hong Fu Jin Industry (ShenZhen) Co., Ltd.**, Shenzhen (CN); **Hon Hai Precision Industry Co., Ltd.**, New Taipei (TW)

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H05K 5/00 (2006.01)

(52) **U.S. Cl.**
USPC **361/759**; 361/807; 361/809

(58) **Field of Classification Search** 361/728–730, 361/807, 810, 752, 759
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,943,214	A *	8/1999	Sato et al.	361/752
7,038,921	B2 *	5/2006	Mitani	361/809
8,174,846	B2 *	5/2012	Hamada et al.	361/810
2007/0017791	A1	1/2007	Peng et al.	
2008/0130208	A1 *	6/2008	Watanabe et al.	361/680
2009/0152087	A1	6/2009	Wang	
2009/0205942	A1 *	8/2009	Sakai et al.	200/341
2010/0188327	A1 *	7/2010	Frid et al.	345/156
2012/0047455	A1 *	2/2012	Yuan et al.	715/781

FOREIGN PATENT DOCUMENTS

CN	2622831	Y	6/2004
CN	2821831	Y	9/2006
CN	201044466	Y	4/2008
JP	2009-288321	*	12/2009
TW	200929294	A	7/2009

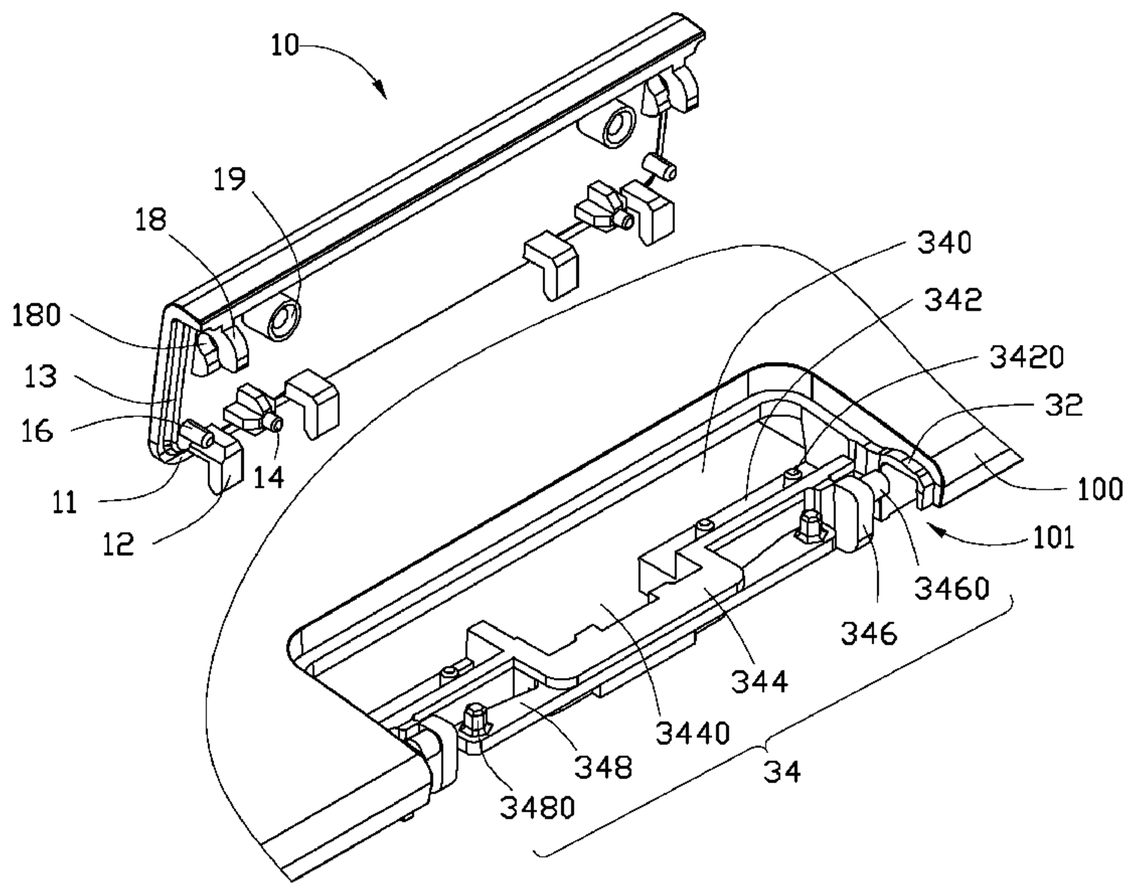
* cited by examiner

Primary Examiner — Hung S Bui
(74) *Attorney, Agent, or Firm* — Altis Law Group, Inc.

(57) **ABSTRACT**

An electronic device includes a main body defining an opening, and a key mechanism secured in the opening. The key mechanism includes a fixing mechanism, a circuit board and a key. The fixing mechanism includes a tab and a support. The tab protrudes from a sidewall of the opening. The support includes an elastic supporting rib connected to the tab. The circuit board is fixed on the support and includes a switch. The key is rotatably connected to the fixing mechanism actuates the switch to generate an input signal. The supporting rib applies a restoring force to the key.

18 Claims, 4 Drawing Sheets



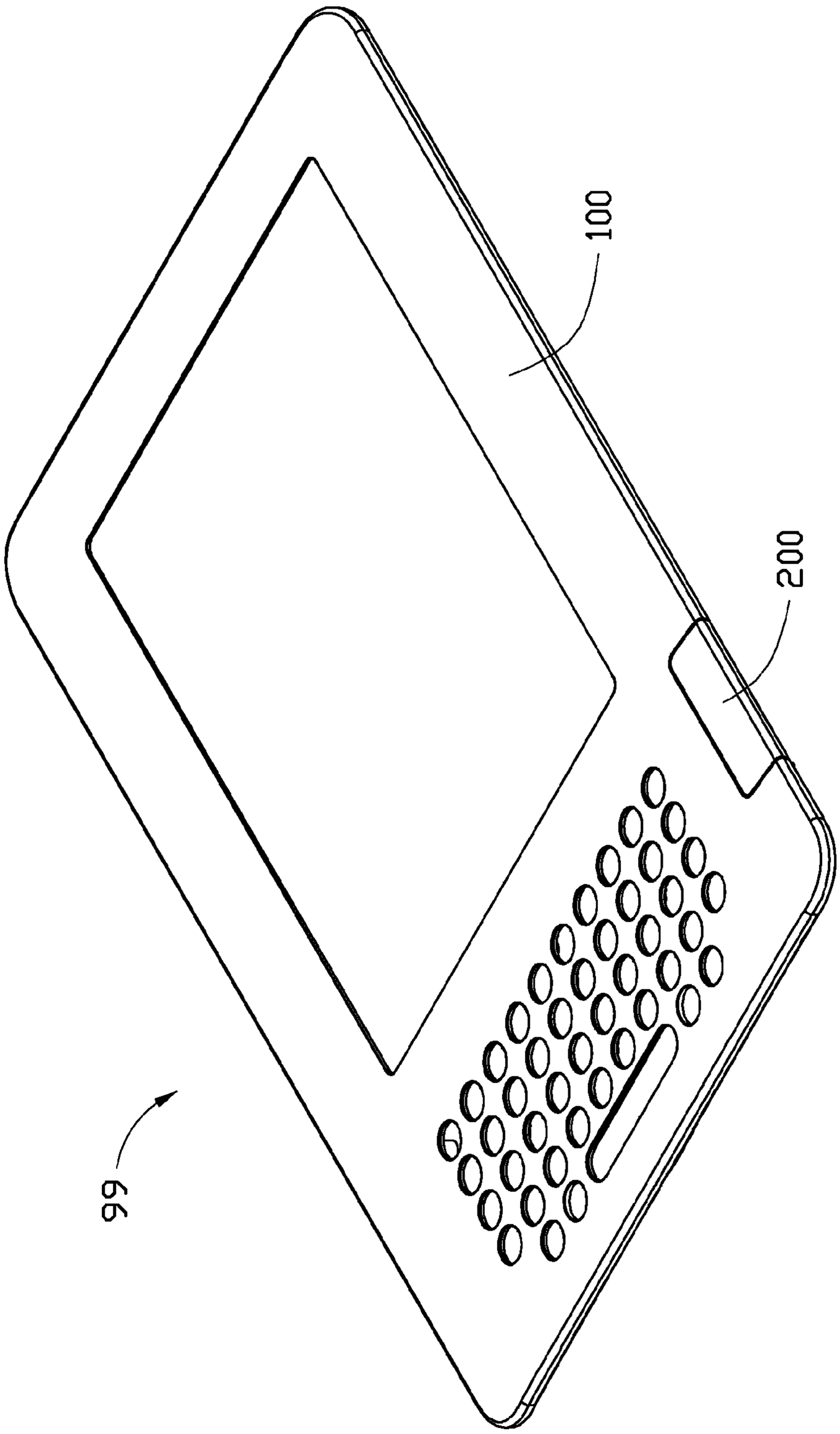


FIG. 1

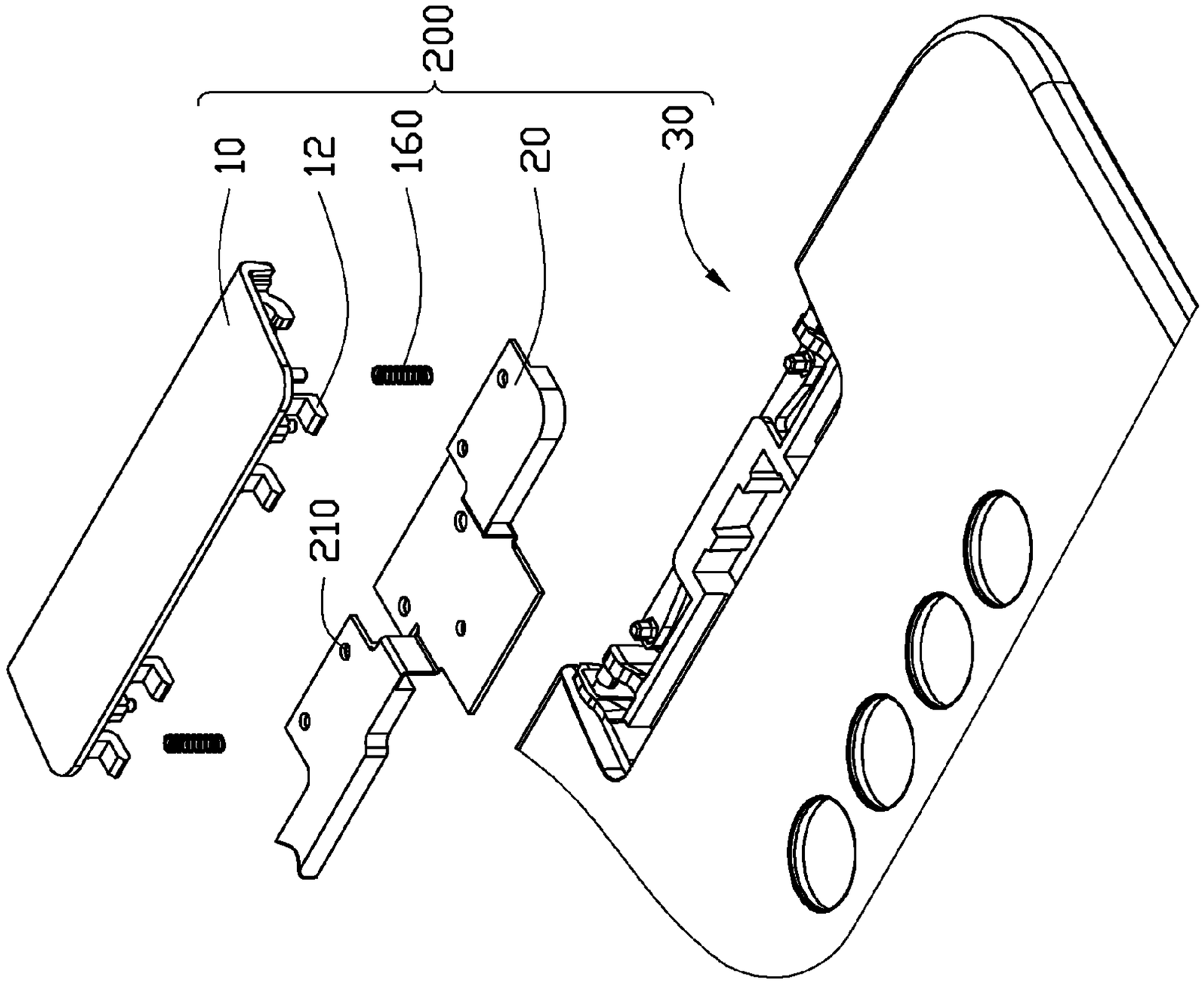


FIG. 2

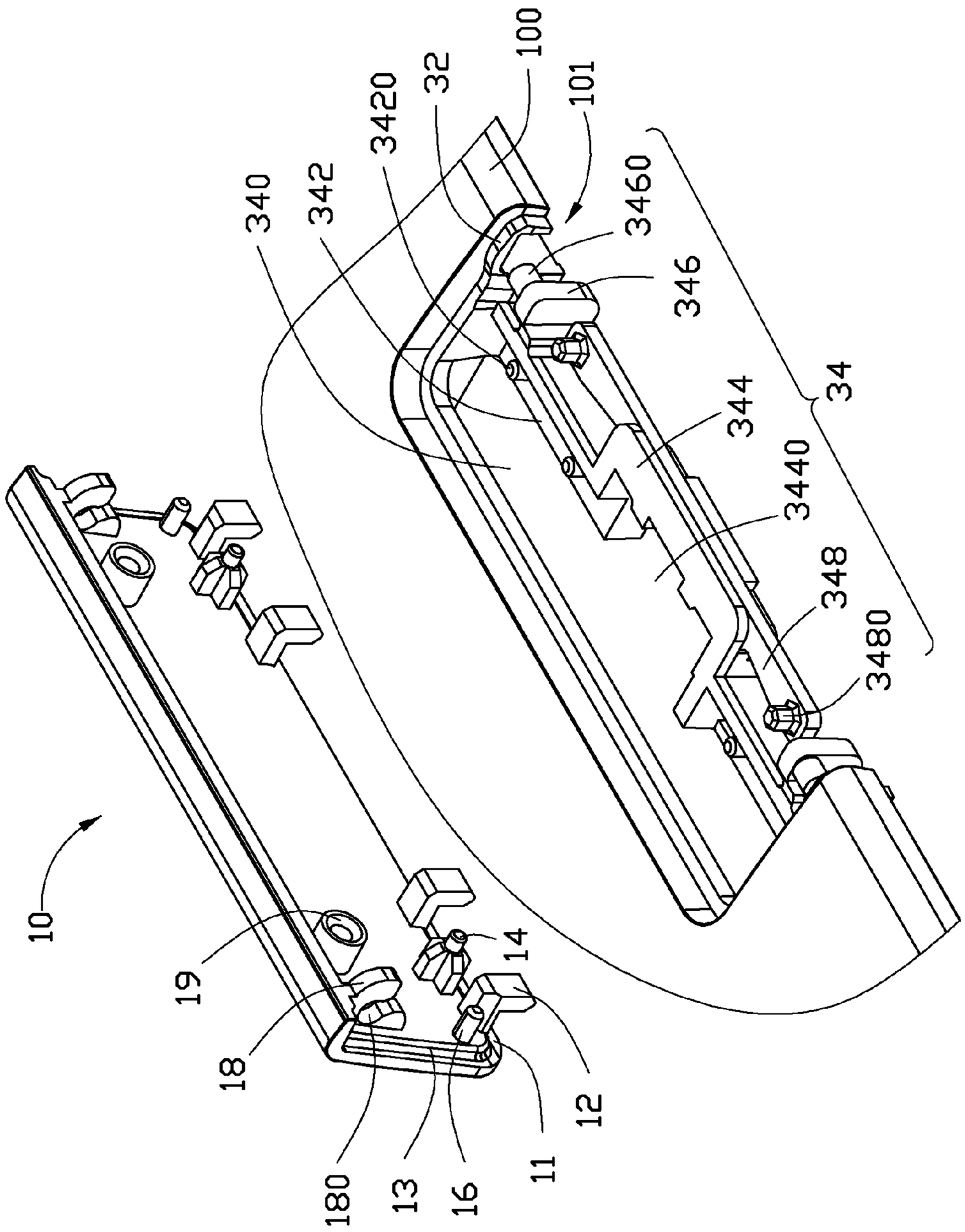

10
19
18
180
13
16
11
12
14
340
342
3420
32
100
101
3460
346
344
3440
348
3480
34

FIG. 3

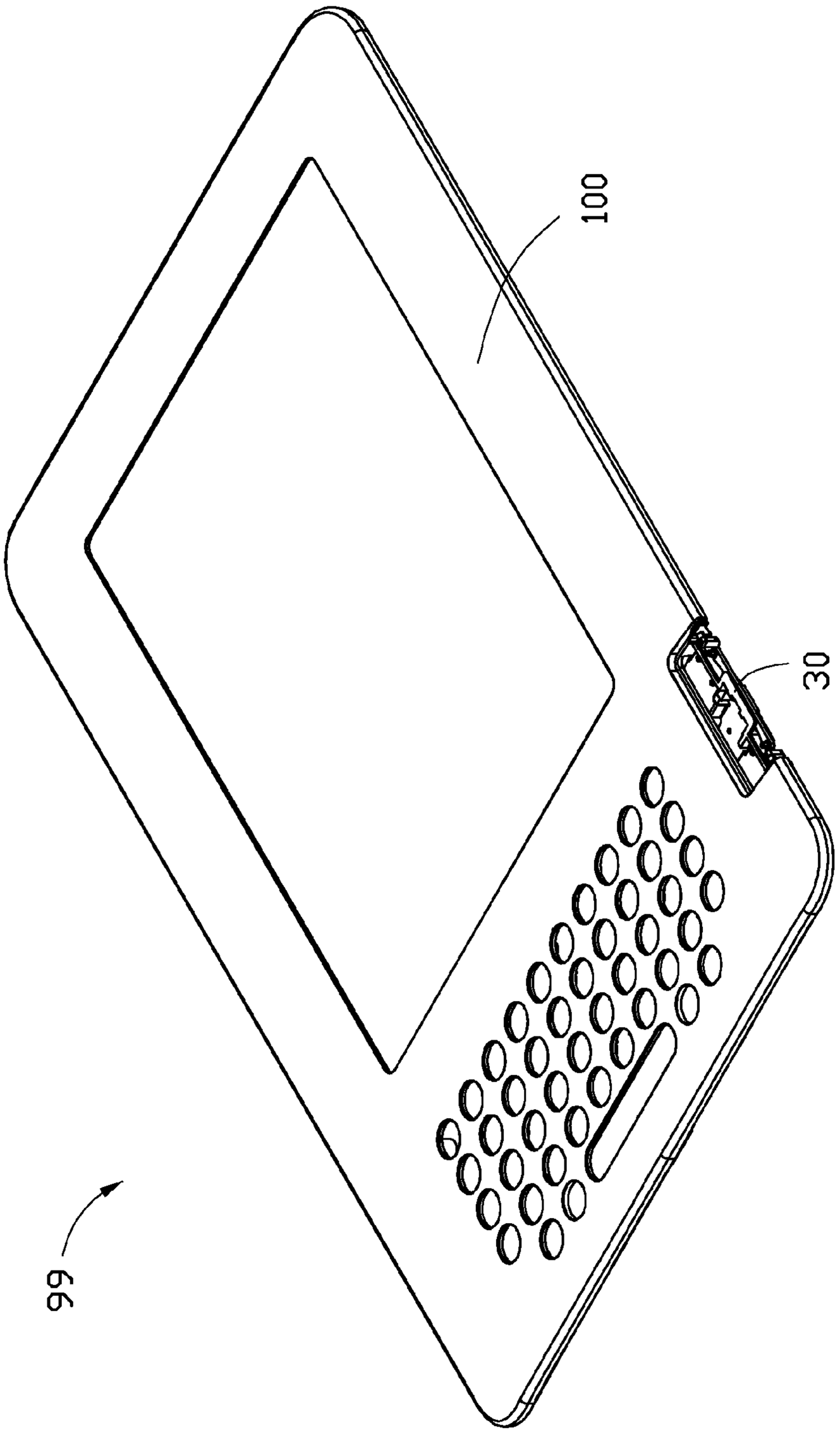


FIG. 4

ELECTRONIC DEVICE WITH KEY MECHANISM THEREOF

BACKGROUND

1. Technical Field

The present disclosure relates to an electronic device with a key mechanism thereof.

2. Description of Related Art

Electronic devices, such as mobile phones and electronic books, include one or more keys, which allow users to conveniently adjust volume, page up and down, or pan the images, are commonly known. Usually, a key secured on the sidewall of the electronic device includes a keycap, a bracket supporting the keycap, a pivot rotatably connecting the keycap to the bracket, an elastic element, and a switch. In use, the keycap rotates about the pivot when being depressed. The pressure is transmitted to the switch by the elastic element. The touch switch is actuated and generates an input signal. The elastic element is also pushes the keycap back to its normal position. However, the restoring forces of the elastic element become weak or even lost after repeated use.

Therefore, what is needed is an electronic device with a key mechanism alleviating the limitations described above.

BRIEF DESCRIPTION OF THE DRAWINGS

The components in the drawings are not necessarily drawn to scale, the emphasis instead being placed upon clearly illustrating the principles of an electronic device with a key mechanism. Moreover, in the drawings, like reference numerals designate corresponding parts throughout the several views.

FIG. **1** is an isometric view of an exemplary embodiment of an electronic device with a key mechanism.

FIG. **2** is a partial, exploded view of the electronic device of FIG. **1**.

FIG. **3** is another partial, exploded view the electronic device of FIG. **1**, viewed from a different aspect.

FIG. **4** is an isometric view of the electronic reader of FIG. **1**, with a key of the key mechanism omitted for clarity.

DETAILED DESCRIPTION

Referring to FIG. **1**, an electronic device **99** is disclosed as an exemplary embodiment. The electronic device **99** includes a main body **100** and a key mechanism **200** secured to the main body **100**. In the embodiment, the electronic device **99** can be an electronic reader. The key mechanism **200** can be used to adjust the audio volume of the electronic reader. In other embodiments, the electronic device **99** may be a mobile phone, or a music player. And, the key mechanism **200** may also perform page up and down or control the moving direction of images shown on the electronic device **99**.

Referring to FIGS. **2** and **3**, an opening **101** is defined in the main body **100**. The key mechanism **200** is secured in the opening **101**. The key mechanism **200** includes a key **10**, a circuit board **20**, and a fixing mechanism **30** secured in the main body **100**. The circuit board **20** is a flexible board and defines a number of fixing holes **210**.

The fixing mechanism **30** includes a tab **32** and a support **34** connected to the tab **32**. A space **340** is defined between the support **34** and the tab **32**. The tab **32** vertically extends along the sidewall of the opening **101**, and is used for supporting the key **10**. The top surface of the key **10** is substantially flush with the upper surface of the main body **100**.

The support **34** supports the circuit board **20** and includes an elastic supporting rib **344**. Two ends of the supporting rib **344** are connected to the tab **32**, for applying a restoring force to the key **10**. The support **34** defines a U-shaped opening **3440** in an inner side facing the tab **32**. The support **34** also includes two cantilevered members **348** formed on its outer side. Each cantilevered member **348** includes a post **3480** formed at its free end and extending upwards.

The support **34** further includes two supporting blocks **342** formed on the inner side facing the tab **32**. Two intersecting sides of the supporting block **342** are respectively connected to the tab **32** and the supporting rib **344**. Each supporting block **342** includes two posts **3420** aligned with the fixing holes **210** of the circuit board **20**. The support **34** further includes two fixing members **346** formed on its outer side. Each fixing member **346** includes a bolt **3460** protruding therefrom and extending horizontally.

The key **10** is elastic and the top surface of the key **10** is smooth. An inner surface of the key **10** includes a first sidewall **11** and a second sidewall **13** adjacent to and perpendicular to the first sidewall **11**, on the periphery thereof. The tab **32** of the fixing mechanism **30** supports the first and second sidewalls **11**, **13**.

Four hooks **12**, two actuating posts **14**, and two retaining posts **16** protrude from the inner surface of the key **10** and are adjacent to the first sidewall **11**. The four hooks **12** are divided into two pairs. The two pairs of the hooks **12** are arranged adjacent to the opposite ends of the first sidewall **11** and are hooked on an inner surface of the tab **32**. In other embodiments, the number of the hooks may be two. The two actuating posts **14** and the two retaining posts **16** are respectively arranged adjacent to the opposite ends of the first sidewall **11**. Each actuating post **14** is located between a pair of the hooks **12** and actuates the switch (not shown) on the circuit board **20** to generate an input signal. The retaining post **16** is located at the corner of the inner surface of the key **10** where the first and second sidewalls **11**, **13** intersect.

A spring **160** is sleeved on each retaining post **16**. A free end of the spring **160** resists the circuit board **20**, for supporting the key **10** together with the retaining post **16** and applying a restoring force to the key **10** together with the supporting rib **344**.

Two fixing elements **18** and two receiving poles **19** also protrude from the inner surface of the key **10**, and are arranged at the opposite ends of the second sidewall **13**. A bolt hole **180** is defined in each of the fixing elements **18**. The bolt **3460** is received in the bolt hole **180** and the key **10** is rotatably connected to the fixing mechanism **30**. The receiving pole **19** is configured for receiving the post **3480** of the cantilevered member **348**, thus strengthening the engagement between the key **10**.

In assembly, the circuit board **20** and the key **10** are connected to the fixing mechanism **30** in sequence. Specifically, referring to FIGS. **2**, **3** and **4**, the fixing holes **210** of the circuit board **20** are first sleeved on the posts **3420**. The circuit board **20** is then arranged on the fixing mechanism **30**. The hooks **12** of the key **10** penetrate from the through hole **340** to resist against the inner surface of the tab **32**. The fixing elements **18** are sleeved on the bolts **3460**, and the receiving poles **19** are pressed to receive the posts **3480**. Finally, the key **10** is pressed until the upper surface of the key **10** is flush with the upper surface of the main body **100**.

In use, one end of the key **10** can be depressed to cause the elastic deformation of the supporting rib **344**. The depressed end of the key **10** rotates about the bolt **3460** of the fixing mechanism **30**. The depressed end and its periphery parts of the key **10** are caused to elastically deform and recess appre-

ciably, causing the retaining post **16**, the actuating post **14** and the spring **160** to be pressed. The actuating post **14** contacts the circuit board **20** to generate an input signal. The key **10** can rotate back to its initial state by the restoring forces of the supporting rib **344** and the spring **160** when the depression on the key **10** is ceased.

In the embodiment, the two ends of the supporting rib **344** resist on the center part of the key **10**. The supporting rib **344** and the spring **160** are caused to be elastically deformed when the key **10** is depressed. The supporting rib **344** and the spring **160** together support the key **10**, and provide restoring forces to the key **10**. The key **10** can then return to its normal position. Since the supporting rib **344** serving as an auxiliary spring elements, the service life of the spring **160** can thus be prolonged. Even when the restoring forces of the spring **160** become weak or lost after repeated use, the key **10** can still work properly due to the elastic supporting rib **344**. Thus the reliability of the electronic device **99** is enhanced.

Although the present disclosure has been specifically described on the basis of the embodiments thereof, the disclosure is not to be construed as being limited thereto. Various changes or modifications may be made to the embodiments without departing from the scope and spirit of the disclosure.

What is claimed is:

1. An electronic device comprising:

a main body defining an opening; and

a key mechanism secured in the opening and comprising:

a fixing mechanism comprising a tab protruding from a sidewall of the opening, and a support comprising an elastic supporting rib connected to the tab;

a circuit board fixed on the support and comprising a switch; and

a key rotatably connected to the fixing mechanism, and configured for actuating the switch to generate an input signal, wherein the supporting rib is configured for applying a restoring force to the key.

2. The electronic device as described in claim **1**, wherein an surface of the key comprises a first sidewall and a second sidewall adjacent to and perpendicular to the first sidewall on the periphery thereof, and the tab supports the first and second sidewalls.

3. The electronic device as described in claim **2**, wherein two actuating posts protrude from opposite ends of the inner surface of the key, and are adjacent to the first sidewall and configured for actuating the switch.

4. The electronic device as described in claim **2**, wherein at least two hooks protrude from opposite ends of the inner surface of the key, and are hooked on an inner surface of the tab.

5. The electronic device as described in claim **2**, wherein two retaining posts protrude from opposite ends of the inner surface of the key, and one spring is sleeved on each of the two retaining posts, each of the spring is configured to apply a restoring force to the key together with the supporting rib.

6. The electronic device as described in claim **2**, wherein the support further comprises two fixing members formed outer side thereon, and each fixing member comprises a bolt protruding therefrom and extending horizontally.

7. The electronic device as described in claim **6**, wherein two fixing elements protrude from the inner surface of the key, and are arranged at the opposite ends of the second sidewall.

8. The electronic device as described in claim **7**, wherein a bolt hole is defined in each of the fixing elements, and the bolt is received in the bolt hole.

9. The electronic device as described in claim **2**, wherein the support further comprises two cantilevered members formed outer side thereon, and each cantilevered member comprises a post formed at the free end and extending upwards thereof.

10. The electronic device as described in claim **9**, wherein two receiving poles protrude from the inner surface of the key, and are arranged at the opposite ends of the second sidewall, and the receiving pole is configured for receiving the post.

11. The electronic device as described in claim **2**, wherein a top surface of the key is substantially flush with an upper surface of the main body.

12. The electronic device as described in claim **2**, wherein the tab extends along the sidewall of the opening and a space is defined between the support and the tab.

13. The electronic device as described in claim **2**, wherein the circuit board is a flexible circuit board.

14. The electronic device as described in claim **2**, wherein the electronic device is an electronic reader and the key mechanism is used for adjusting audio volume of the electronic reader.

15. An electronic reader comprising:

a main body defining an opening; and

a key mechanism configured for adjusting audio volume of the electronic reader, and secured in the opening, the key mechanism comprising:

a fixing mechanism comprising a tab protruding from a sidewall of the opening, and a support comprising an elastic supporting rib connected to the tab;

a circuit board fixed on the support and comprising a switch; and

a key rotatably connected to the fixing mechanism, and configured for actuating the switch to generate an input signal, wherein the supporting rib is configured for applying a restoring force to the key.

16. The electronic reader as described in claim **15**, wherein a top surface of the key is substantially flush with an upper surface of the main body.

17. The electronic reader as described in claim **15**, wherein the tab extends along the sidewall of the opening and a space is defined between the support and the tab.

18. The electronic reader as described in claim **15**, wherein the circuit board is a flexible circuit board.

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